Compositional Dynamics and the Performance of the U.S. Banking Industry

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Abstract

As the U.S. banking industry continuously evolves, changes in industry composition have a direct impact on the aggregate performance of the industry. This paper presents a new decomposition framework for commercial banks and shows both firm-level changes and dynamic reallocation effects – due to increased market share of successful banks, exit of poor performers, and new entrants – made substantial contributions to changes in profitability and capitalization of the U.S. banking industry from 1976 to 1998. In periods of declining profits, these reallocations were particularly important, increasing industry return on equity by several percentage points in the late 1980s and stabilizing industry performance. In the late 1990s, however, the reallocation effects turned negative and lowered industry profits as growing banks showed declining profits on net. These results provide a new perspective for understanding the impact of changes in competition on the performance of the U.S. banking industry.
(JEL Codes: G21, L11)

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I. Introduction

Studies of longitudinal data for U.S. manufacturing plants reveal enormous heterogeneity across plants and highlight the importance of the changing composition of firms within an industry. A substantial portion of industry-wide productivity gains, for example, reflect the reallocation of output from low to high productivity plants, rather than productivity gains at individual plants. Since these reallocation effects are often interpreted as the benefits of the competitive process as plants innovate, adapt, and fight for survival, separating reallocation effects from plant-level gains provides valuable information about the factors driving changes in industry performance.[1]

Reallocation effects, however, have been noticeably absent from studies of the U.S banking industry despite a long history of longitudinal research. The banking studies typically focus on microeconomic questions such as economies of scale or scope, input substitution, and frontier efficiency, while ignoring the aggregation and composition issues so common in the manufacturing literature. This omission is particularly surprising given the enormous heterogeneity across U.S. banks and the massive reallocation of resources associated with steady consolidation in the 1980s and 1990s. These two facts suggest a large impact from reallocation effects in U.S. banking.

This paper fills the research gap by quantifying how dynamic reallocation effects contribute to the performance of the U.S. banking industry as a whole from 1976 to 1998. Building on tools developed in the manufacturing studies, I present a novel decomposition framework that accounts for consolidation dynamics unique to banks. The decomposition identifies and measures two broad factors that jointly determine the performance of the U.S. banking industry: "within effects" due to changes in surviving banks and "reallocation effects" due to market share changes, entry, and exit. By focusing on bank-level results and the corresponding aggregation issues, this analysis provides new insights into the impact of competition and the evolution of U.S. banking.

The results show changes in the performance of surviving banks determine industry trends, but dynamic reallocation effects also make important contributions to changes in industry profitability and capital adequacy. When overall industry profitability increased, for example, about three-quarters of industry-wide gains were due to increased profits at individual banks. The remaining gains reflect dynamic reallocation effects as market share shifted from low to high profit banks. In periods of declining profits, however, reallocation effects remained positive and increased in size. This resource reallocation improved industry performance as the strongest commercial banks grew in relative size, while the weakest exited the industry.

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[1]Baily, Hulten, and Campbell (1992) is an important, early example from the manufacturing literature and Haltiwanger (1997) provides recent references.

Variation in the reallocation effects over time also provides a new perspective on the impact of the competitive process. When consolidation and deregulation accelerated in U.S. banking during the late 1980s and early 1990s reallocation effects increased dramatically, implying that industry restructuring made substantial contributions to gains in industry profits. The late 1990s, however, are markedly different – reallocation effects were consistently negative after 1995 as changes in bank size and profitability were negatively correlated on net. While surprising, this finding is consistent with the casual observation that many large bank mergers in recent years have not improved performance. These results show resource reallocation in the late 1990s actually lowered industry profitability.

II. The Importance of Heterogeneity

Reallocation studies of manufacturing productivity have emphasized how changes in the composition of plants within an industry affect performance of the industry as a whole. Bartelsman and Dhrymes (1998) state, "aggregate productivity growth reflects both changes in productivity at the most disaggregated level, and changes in resource allocation among the constituent units (pg. 6)." That is, aggregate productivity can increase for many reasons: if individual firms become more productive, if firms with above-average productivity increase market share, if new firms enter with above-average performance, or if below-average firms exit. Since these alternative scenarios imply different causal stories, e.g., exogenous technical progress vs. learning-by-doing vs. economies of scale and scope vs. embodied technical progress vs. the impact of the competitive and regulatory environment, one must look at the micro data to determine which one is correct.

a) Micro Studies in Manufacturing and in Banking

The availability of detailed establishment-level data for manufacturing industries in the Longitudinal Research Database (LRD) at the U.S. Census created a wave of applied microeconomic research on a wide range of topics.[2] One robust finding is large heterogeneity with greater variation in fundamental variables like plant size, plant age, wages, investment, and productivity within narrowly defined manufacturing industries than between industries. This heterogeneity implies aggregate data mask important micro-dynamics and offers empirical support for models that incorporate heterogeneity at a fundamental level, e.g., Jovanovic (1982) and Olley and Pakes (1996).

The micro data also that show idiosyncratic factors largely determine important economic variables. Haltiwanger (1997), for example, reports a four-digit SIC industry effect explains less than 10% of the variation in the growth of fundamental variables like employment, capital, output, and productivity across manufacturing plants from 1977 to 1987. Specific studies that examine a wide range

[2]See McGuckin (1995) for details on the LRD and the importance of this dataset.

of issues using plant-level data include Davis, Haltiwanger, and Schuh (1996) on job creation and destruction; Caballero, Engel, and Haltiwanger (1997), Cooper, Haltiwanger, and Power (1999), and Power (1997) on investment; Bahk and Gort (1993) on learning-by-doing; Baily, Hulten, and Campbell (1992), Olley and Pakes (1996), Bartelsman and Dhrymes (1998) and Jensen, McGuckin, and Stiroh (1998) on productivity dynamics.[3]

Firm heterogeneity is also an important issue in the large literature on commercial bank behavior, but the focus there has been quite different. Rather than using firm-level differences as a building block to explain industry trends, this work has typically remained grounded in microeconomics and used firm-level variation to explain and identify the production structure of financial institutions. This literature is immense and covers many related topics including Berger, Hanweck, and Humphrey (1987) and Jagtiani and Khanthavit (1996) on returns to scale; Berger and Mester (1999) and Stiroh (1999b) on productivity growth; Berger, Hancock, and Humphrey (1993) and Berger and Mester (1997) on cost and profit efficiency; Noulas, Ray, and Miller (1990) and Stiroh (1999a) on input substitution; Berger and Hannan (1998) and Hannan (1991) on market power; Kashyap and Stein (1999) on the monetary policy transmission mechanism; and Akhavein, Berger, and Humphrey (1997) and Rhoades (1998) on the impact of mergers and acquisitions.[4]

While these topics are important, they are primarily concerned with the microeconomic behavior of the individual firm and are not focused on the aggregate implications. This is not to say that all banking studies ignore reallocation and aggregation effects. Jayaratne and Strahan (1998), for example, argue that deregulation triggered reallocation as strong banks expanded at the expense of weaker ones and Berger and Mester (1997) calculate 12% of aggregate banking costs are due to relative inefficiency. Similarly, estimates of shifting cost frontiers in Berger and Mester (1997), Stiroh (1999b), and others have clear implications for the future performance of the industry as a whole. Rather, it is important to recognize the fundamentally different focus between the banking literature, which concentrates on microeconomic issues, and the manufacturing literature, which is more concerned with aggregation and composition issues.

It is difficult to be certain why research agendas in manufacturing and banking have diverged, but some speculation is warranted. Banking is obviously the more regulated industry, and the focus of banking research on individual firms could reflect a regulator's concern about the health and solvency of particular banks. The manufacturing research, on the other hand, has evolved from the macroeconomic fields of growth and business cycles, which are more interested in the sources of aggregate fluctuations.

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[3]See Haltiwanger (1997) for a more comprehensive list of references.

[4]This list is by no means exhaustive and is meant only to show the breadth of the research topics that use bank-level data. Berger, Demsetz, and Strahan (1999) provide a survey in the context of financial consolidation.

A second potential explanation lies in the data and conventional performance measure in each industry. In manufacturing, productivity (outputs per inputs) is the standard gauge of performance and is relatively easy to estimate,[5] but aggregation is more difficult. In banking, output and productivity are much harder to estimate due to definitional problems, joint products, and conceptual issues about which services a bank actually provides.[6] To avoid these problems, researchers interested in the performance of the banking industry have often looked at profitability or costs. Profitability and costs, however, are straightforward to calculate and aggregate, there may have been no reason for bank researchers to be interested in the aggregation and reallocation issues that concerned the manufacturing analysts.

Whatever the cause, these two lines of inquiry have clearly diverged. An important goal of this paper is to bring the perspective and analytic tools from the manufacturing studies to better understand the evolution of the U.S. banking industry. The remainder of this section develops a decomposition framework appropriate for the commercial bank industry.

b) Reconciling Firm and Industry Performance in Banking

Baily, Hulten, and Campbell (1992) present an algebraic decomposition of manufacturing productivity growth into three components: a "within effect" measures the contribution from the changing performance of surviving plants; a "between effect" measures the contribution from the changing share of surviving plants; and a "net-entry effect" compares entrants to exiters and measures the net contribution from plant turnover. Building on this analysis, Haltiwanger (1997) provides additional detail by breaking out the separate impact of entering and exiting plants, explicitly comparing the performance of each plant to the industry average, and including a "covariance effect" associated with plants changing both size and productivity. Using data from the LRD, these papers conclude that dynamic reallocation effects due to wide heterogeneity, share changes, and entry/exit decisions are major determinants of total factor productivity growth in U.S. manufacturing.

The banking industry, however, differs from manufacturing in fundamental ways, requiring modifications to the earlier decomposition approach. Most important, the unit of analysis and concept of "exit" are somewhat different in banking. In the LRD, distinct manufacturing plants can be identified by a unique physical location. Plant exit is therefore a straightforward concept when a plant shuts down operations and ceases production. In contrast, the productive capacity of a bank is much more liquid and can be easily shifted. For example, a bank may be acquired and lose its status as a separate entity, but this does not mean that operations end or the ability to provide banking services is lost. Similarly, if

[5]While manufacturing clearly has some difficult measurement issues, e.g., quality change and deflation, multiple products and joint production, introduction of new products, and outsourcing issues, they are generally thought to be less severe than in services.

[6]Humphrey (192) and Triplett (1998) discuss many of the difficulties associated with measuring bank output.

regulators close a bank, assets and liabilities are typically sold to an existing institution. Thus, bank exit is intricately connected with changes in the assets of surviving banks. The alternative decomposition methodology presented below incorporates this fundamental connection.

A second contrast between manufacturing and banking is the appropriate metric of performance. As mentioned above, it is relatively straightforward to calculate labor productivity (output per hour worked) in manufacturing plants and even total factor productivity (output per unit of all inputs) can be reasonably estimated across plants. In banking, however, concepts of output and productivity are less clear so this paper focuses on two readily observable proxies of industry performance – profitability and capital ratios. Both measure the success of the industry and can tracked over time to show the industry evolution. The corresponding decomposition is conceptually similar, but interpretation is somewhat different since productivity generally trends upward while profitability and capital ratios are more stationary. Rather than explaining the contribution to trend growth, this decomposition answers a different question by explaining changes in profitability and capital ratios from one period to the next.

Consider return on equity (ROE) for the banking industry as a whole. Industry ROE at time t, R_t, is defined as industry net income, I_t, divided by industry equity, E_t, which equals:

$$(1) \qquad R_t = \frac{I_t}{E_t} = \frac{\sum_i I_{i,t}}{\sum_i E_{i,t}}$$

where $I_{i,t}$, and $E_{i,t}$ are net income and equity, respectively, for bank i and the summation runs over all banks operating in period t.

Industry ROE, R_t, can be rewritten as a weighted average of ROE for the individual banks, $R_{i,t}$:

$$(2) \quad R_t = \sum_i R_{i,t} q_{i,t} = \sum_i \frac{I_{i,t}}{E_{i,t}} \frac{E_{i,t}}{\sum_i E_{i,t}}$$

where $q_{i,t}$, represents the share of industry equity held by bank i at time t.

Change in industry ROE over two periods can be expressed in the following decomposition:

$$\Delta R_t = R_t - R_{t-1} =$$

$$(3) \qquad \underbrace{\sum_{\text{operate in } t-1} \left[\Delta R_{i,t} * q_{i,t-1}\right]}_{\textit{within effect}} + \underbrace{\left[\Delta q_{i,t} * (R_{i,t-1} - R_{t-1})\right]}_{\textit{share effect}} + \underbrace{\left[\Delta R_{i,t} * \Delta q_{i,t}\right]}_{\text{cov}\textit{ariance effect}} +$$

$$\underbrace{\sum_{\text{operate in } t \text{ only}} q_{i,t} * (R_{i,t} - R_{t-1})}_{\textit{entry effect}}$$

where Δ refers to a discrete change from period *t-1* to period *t*.

Each element in Equation (3) has a precise economic meaning, and together they show how bank-level profit and share changes generate industry changes. The first summation includes banks that operated in the initial period, including both "surviving" banks that operated in both periods and "exiting" banks that operated only in the first period. The second summation includes "entering" banks that operated only in the second period. By looking at the relative performance of these subsets of banks, one can identify the sources of ROE changes for the industry as a whole.

The first set of brackets is a "within effect," which measures the aggregate impact of changes in ROE for surviving banks. Changes in profitability for each bank contribute to industry profitability changes in proportion to their relative size, as measured by their equity share in the first period. The sum across all surviving banks represents the core of the industry and drives industry performance. As financial conditions, the macroeconomic environment, technology, or regulatory structure change, the ROE of these surviving banks fluctuates and determines industry trends. Thus, there is no strong prior on the sign of the within effect, but rather it will change with overall economic conditions.

The second set of brackets is a "share effect," which measures the aggregate impact of changes in the size of banks. Changes in the relative size of each bank affect industry performance based on the bank's relative performance, e.g., growth in a bank with above average ROE raises industry profits. An important point is that this summation includes both surviving and exiting banks. Conceptually, combining surviving and exiting banks is appealing since banks do not exit the way manufacturing plants do. Rather, assets and liabilities are typically transferred from an exiting to surviving banks, so it is appropriate to combine both changes into a single share effect that captures the net impact of consolidation.[7] One would expect the share effect to be positive as relatively successful banks gain market share and increase in size.

The third set of brackets is a "covariance effect," which measures the aggregate impact of surviving banks due to both share and performance changes. A bank that increases both profits and size increases industry profits, while a bank that grows but shows lower profits would decrease industry profits. The expected sign of the covariance effect is ambiguous. Growing banks may face diminishing marginal returns so average profits would decline with size, suggesting a negative covariance effect. Alternatively, growing banks may gain from economies of scale and scope or benefit from unobserved differences that drive both increases in size and better performance, e.g., management skills or regional economic forces. Similarly, technological or regulatory shocks could induce both higher profits and

[7]The decomposition in Haltiwanger (1997, Eq. 7) explicitly separates the share effect into a between effect for surviving banks and an exit effect for exiting banks. This can be easily reconciled with Equation (3) since $-\Sigma\theta_{i,t-1\tau}*(R_{i,t-1}-R_{t-1}) = \Sigma(0-\theta_{t-1})*(R_{i,t-1}-R_{t-1}))=\Sigma\Delta\theta_{t-1}*(R_{i,t-1}-R_{t-1})$ for the exiting banks, so this definition of a share effect equals the sum of Haltiwanger's between effect and exit effect. I do not follow this approach due to differences between banking and manufacturing described above.

increased size, implying a positive covariance effect. As a point of reference, Haltiwanger (1997) reports a strong positive covariance effect for manufacturing plants.

The second summation is an "entry effect," which measures the aggregate impact on ROE from entering banks. These banks operate only in the second period, receive a weight equal to their industry share, and increase industry ROE only if their profits are above average. One expects the entry effect to be negative – DeYound and Hasan (1998) report entering banks are typically small and under-perform the industry, while Haltiwanger (1997) and Jensen, McGuckin, and Stiroh (1998) find new manufacturing plants are less productive than incumbents.

One concern with the decomposition in Equation (3) is that not all change is the same. Banks growing through acquisition may be fundamentally different from banks that rely on internal growth. It may be useful for understanding the impact of consolidation to break out the contribution of acquirers from non-acquirers. Rewriting Equation (3) to separate acquirers from non-acquirers yields:

$$
\begin{aligned}
\Delta R_t = R_t - R_{t-1} = \\
&\underbrace{\sum_{\substack{\text{operate in } t-1,\\ \text{acquirer}}} \left[\Delta R_{i,t} * q_{i,t-1}\right]}_{\textit{within effect, acquirer}} + \underbrace{\sum_{\substack{\text{operate in } t-1,\\ \text{non-acquirer}}} \left[\Delta R_{i,t} * q_{i,t-1}\right]}_{\textit{within effect, non-acquirer}} \\
&+ \underbrace{\sum_{\substack{\text{operate in } t-1,\\ \text{acquirer or exit}}} \left[\Delta q_{i,t} * (R_{i,t-1} - R_{t-1})\right]}_{\textit{share effect, consolidation}} + \underbrace{\sum_{\substack{\text{operate in } t-t,\\ \text{non-acquirer}}} \left[\Delta q_{i,t} * (R_{i,t-1} - R_{t-1})\right]}_{\textit{share effect, non-acquirer}} \\
&+ \underbrace{\sum_{\substack{\text{operate in } t-1,\\ \text{acquirer}}} \left[\Delta R_{i,t} * \Delta q_{i,t}\right]}_{\text{cov}\textit{ariance effect, acquirer}} + \underbrace{\sum_{\substack{\text{operate in } t-1,\\ \text{non-acquirer}}} \left[\Delta R_{i,t} * \Delta q_{i,t}\right]}_{\text{cov}\textit{ariance effect, non-acquirer}} \\
&+ \underbrace{\sum_{\text{operate in } t \text{ only}} q_{i,t} * (R_{i,t} - R_{t-1})}_{\textit{entry effect}}
\end{aligned}
\tag{4}
$$

The first line breaks the within effect into two parts – the industry contribution from improved performance of banks that made an acquisition (acquirer) between periods *t-1* and *t* and those that did not (non-acquirer).[8] The second line breaks the share effect into two similar parts. Surviving banks that made an acquisition and exiting banks are both included in the first summation (consolidation), so this captures the net effect of bank consolidation as assets and liabilities are transferred from exiting to acquiring banks. The second summation includes only non-acquirers and reflects the impact of internal growth. The third line breaks also breaks the covariance effect across acquirers and non-acquirers. The final line is the same as in Equation (3) and includes only newly entered banks. The following section

provides empirical estimates for each of these separate factors, with the share, covariance, and entry effects jointly determining the "total reallocation effect."

III. Empirical Results

Equation (4) provides an appropriate methodology to decompose changes in the performance of the banking industry into various firm-level factors and several recent trends in the U.S. banking industry make it an ideal industry for this type of analysis. First, the industry is steadily consolidating with the number of commercial banks falling from over 14,000 in 1976 to less than 9,000 in 1998, although a large core of over 6,500 banks operated for the full 23 years. Second, there has been steady entry despite the dramatic net decline in the number of banks. Third, industry performance has fluctuated dramatically over this period with industry return on assets (ROA) ranging from 0.67 percent in 1976 to 0.09 percent in 1987 to 1.14 percent in 1998.[9] Finally, complex dynamics underlie the industry trends as the industry was continually churning with some banks thriving during the lean years, others struggling in the strong years, and entry/exit constantly changing the composition of the industry.

a) Variation in Bank Performance

Firm-level heterogeneity and reallocation effects imply that industry data do not capture the richness of the micro story. If substantial variation does not exist, however, representative firm models remain appropriate, and one can simply look at aggregate data without following the underlying variation. Before proceeding with the empirical decomposition in Equation (4), therefore, it is necessary to document significant variation within U.S. banking.[10]

Table 1 presents basic summary statistics for nearly 300,000 annual observations from over 18,000 commercial banks to show the variation from 1976 to 1998.[11] All three variables – assets, return on equity (ROE), and equity capital to assets ratio (E/A) – vary widely within the industry in each year and over time. In the low profit year of 1987, for example, the sample had a weighted average ROE of 2.50% and a median ROE of 9.55%. One quarter of all individual commercial banks (nearly 3,300 institutions), however, reported a ROE of over 13.32%, which exceeded the median ROE in all but two years. Likewise, in the high profit year of 1993 the sample as a whole posted a ROE of 14.43%, but over

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[8]Data are year-end, so a bank is identified as an acquirer if it makes an acquisition in during the second year.

[9]These industry totals are for all commercial banks insured by the Federal Deposit Insurance Corporation (FDIC) and reported in FDIC (1999) and their webpage: http://www2.fdic.gov. Berger, Kashyap, and Scalise (1995) and FDIC (1997) provide details on the evolution of the U.S. banking industry in the 1980s and early 1990s

[10]Data are at the level of the individual commercial bank and are taken from the Reports of Condition and Income. Details on the data and sample construction are in the Appendix.

[11]The sample covered about 85 percent of the assets held by all FDIC-insured commercial banks in 1998. As explained in the Appendix, some observations were dropped due to incomplete or unreliable data.

2,700 banks posted a ROE of less than 8.78%, which was below the median ROE in all other years. Variation of a similar magnitude is true in every year and for return on assets (not shown).

Since the sample includes small community banks with less than $100 million in assets as well as large money center banks with over $300 billion in assets, this variability is not surprising. Similarly, banks differ markedly in their sources of income with some banks focusing on business lending, others on consumer lending, and some on non-interest fee income activities.[12] Whether differences exist primarily across size classes or business lines, this variation suggests reallocation effects will be important as the aggregate data reflect the changing mix of heterogeneous banks within the industry.

Tables 2a and 2b extend the focus on heterogeneity by comparing the different subsets of banks identified in Equation (4). These five subsets – surviving banks that acquire, surviving banks that do not acquire, entering banks, and exiting banks (including merged and failed banks) – were identified for each pair of consecutive years from 1976 to 1998 as follows. Surviving banks operated in each of the consecutive years; acquirers made an acquisition in that period, while non-acquirers did not. Entering banks were observed in the second year, but not the first. Exiting banks were observed in the first year, but not the second year, and were placed into either the "merged" or "failed" categories based on the nature of the asset disposition. The Appendix provides details on the data construction.

Table 2a presents the mean and standard deviation of assets, and the number of observations for each subset. Table 2b presents the mean and standard deviation for both ROE and E/A for the same subsets of banks. To conserve space, only four comparison periods – 1976-77, 1985-86, 1990-91, and 1997-98 – are shown; other years are similar. Table 3 then presents the number of observations in each subset for each year from 1976 to 1998.

Tables 2a and 2b show large and systematic differences between subsets of commercial banks that meet prior expectations. Surviving banks that acquire were considerably larger, but no more profitable, than non-acquiring survivors. Acquirers also tended to be less capitalized. Consistent with DeYoung and Hasan (1998), who find that new entrants are substantially less efficient that incumbent banks, entering banks were small and unprofitable, but highly capitalized. Banks that exited through mergers were small and unprofitable, but well capitalized, while banks that exited through failure were even smaller, more unprofitable, and more poorly capitalized.

In terms of differences in the variation across the subsets, acquirers showed a much larger standard deviation for assets. This reflects the small number of enormous banks that were frequent acquirers. While all subsets showed substantial within variation in profitability and capitalization, there was little systematic difference in the standard deviation of either ROE or E/A across the subsets. Only

[12]Radecki (1999), for example, documents the increased reliance on payments-driven revenue

the exiting banks showed an outlying standard deviation due to the large losses incurred by some banks in the year before they left the industry.

Since aggregate data reveal only the average of this substantial heterogeneity, it is difficult to completely understand determinants of aggregate performance without accounting for firm-level differences. Implications about the competitive process, for example, are quite different if all industry gains are due to the growing dominance of several large banks as opposed to industry gains that are driven by rapid entry and exit of many small banks. Only by focusing on the micro data and the underlying dynamics through the type of decomposition analysis described above can one understand the forces driving changes in industry performance.

b) Decomposition Results

Tables 4 and 5 report results from the annual decomposition for industry ROE and E/A from 1976 to 1998. In both tables, the first column shows the ratio for the industry as a whole (measured as a weighted average), while the second column presents the industry change from one year to the next. This industry change is then decomposed into within effects and various reallocation effects as in Equation (4). The within effect represents change in industry performance due to bank-level changes for institutions that operate in consecutive years, while the total reallocation effect represents change in industry performance due to reallocations between banks. The total reallocation effect is broken down into the share, covariance, and entry effects as in Equation (4).

Both sets of decomposition results show the within effect is the primary determinant of industry-wide changes, although dynamic reallocation effects also make substantial contributions. While total reallocation effects are generally stronger for profitability, particularly in periods of declining profits, the results show that accounting for composition changes is important for understanding industry trends in U.S. banking.[13]

The ROE decomposition in Table 4 shows the within effect determines the direction of the industry performance, while the reallocation effect typically stabilizes the industry. In 19 of the 22 periods, the within effect was same sign as the overall industry change and typically large. In contrast, the total reallocation effect was the same sign in only half of the years and typically smaller. This suggests the core of surviving banks determine industry performance in any period as individual banks respond to changing macroeconomic and business conditions. In the turmoil of the late 1980s, for example, the within effect was responsible for the majority of the huge decline in 1986-87 as several dominant institutions suffered large losses, and also for the subsequent rebound in 1987-88. Similarly,

[13]Although Haltiwanger (1997) presented a decomposition of total factor productivity growth for manufacturing, the results are broadly consistent. He finds that within effects explained about half of industry changes and a relatively large covariance effect.

the profit pickup in the early 1990s can be largely attributed to firm-level gains as the economy improved following the 1990-91 recession.[14]

The reallocation effects are also important, particularly in years when industry profits fell. In the 9 years when industry profits increased, for example, industry ROE gains summed to 21.2 percentage points, with 16.1 coming from the within effect and only 5.1 from the reallocation effects. In contrast, during the 13 years when industry profits declined by a total of 18.9 percentage points, the within effect made a negative contribution of 32 percentage points; reallocation effects *added* 12.8 percentage points during these years of declining profits. During these lean years, e.g., 1983-84, 1986-87, or 1988-89, reallocation effects substantially improved industry profitability as the competitive process shifted market share from low to high ROE banks. Thus, dynamic reallocation effects prevented the industry as a whole from doing as poorly as the core of surviving banks.

The entry effect for ROE was typically small and negative as poor-performing banks entered the industry with little market share. This supports earlier work by DeYoung and Hasan (1998) and provides evidence against the notion that recent entrants are somehow different from those in earlier periods. Some have argued, for example, that consolidation displaced experienced bankers who are now creating new banks with strong initial profits. These results show that entrants are still a net drain on bank profits, at least in their first year.

ROE reallocation effects also show several interesting changes over time; Chart 1 plots the time series of total reallocation effects (the 7th column in Table 4). Most noticeably, reallocation effects increased dramatically in the mid-1980s when U.S. banking began massive consolidation due to deregulation and increased bank failures. This is consistent with the idea that deregulation increased competitive pressures and sparked massive restructuring, which improved industry performance.

Jayaratne and Strahan (1998), for example, use a different framework that relies on the exogeneity of state-level deregulation to identify changes in the competitive structure and conclude, "the average bank that grew after branching deregulation was a high-profit bank (pg. 268)." These estimates take the next step and show that this transfer of assets made a meaningful contribution to the profitability of the banking industry as a whole. Also consistent with Jayaratne and Strahan (1998), the share effects increased in size in the late 1980s and early 1990s after branching deregulation began.

A second obvious trend in Chart 1 is the emergence of negative reallocation effects in the late 1990s. This is the only period of negative reallocation effects and suggests that something fundamental has changed in recent years. Details from Table 4 shows that this largely reflects a negative covariance effect – increases in profits were negatively correlated with increases in size for both acquirers and non-

[14]Boyd and Gertler (1994) report a similar result, concluding that large, incumbent banks were primarily responsible

acquirers. Consistent with the notion that many large bank mergers in the late 1990s did not improve bottom-line results, the impact of consolidation in U.S. banking appears quite different in the late 1990s. This could reflect the well-known agency problems associated with acquisitions as managers expand to further their own interests at the expense of shareholders or the onset of diminishing returns as some banks moved beyond the optimal scale.

Taken together, these ROE decomposition results show that both bank-level and industry reallocations made substantial contributions to changes in profitability of the U.S. banking industry. This distinction is important as failure to account for the dynamic reallocation effects can create mistaken impressions about the underlying strength of the industry. For example, aggregate data might lead one to conclude that profits for the typical bank increased slightly for 1990-91, but this decomposition shows that firm-level profits made a negative contribution of more than a full percentage point. Reallocation effects made a positive contribution and increased industry profitability.

For the E/A decomposition results, Table 5 shows the within effect dominates industry performance, with reallocation effects appearing quantitatively less important. For the full period 1976-98, for example, industry capital ratios increased 2.55 percentage points on net, with 2.33 percentage points due to the within effect and only 0.22 due to the reallocation effects. In contrast to the ROE results, the dominance of the within effect is true in both periods of increasing and decreasing industry capitalization.

The detailed breakdown in Table 5 shows additional results of interest. First, the covariance effect is almost always negative as banks that increase market share experienced declining capital ratios on net. This is true for both acquirers and non-acquirers, although the covariance effect of acquirers was positive during the mid-1990s. In addition, the entry effect was relatively small and positive in every year except one as new banks were relatively well capitalized. Due to their small size, these entrants made unsubstantial contribution to industry capitalization. In contrast to the ROE results, E/A total reallocation effects do not show any interesting variation over time.

IV. Conclusions

This paper examines changes in the composition of the U.S. banking industry from 1976 to 1998 and shows dynamic reallocation effects play an important role in determining the performance of the industry as a whole. In periods of rising profitability, changes in the performance of surviving banks account for the majority of industry gains, with a smaller portion due to reallocations of market share to more profitable banks. When profits are falling, however, dynamic reallocations become much more important, stabilizing the industry and preventing it from doing as poorly as the core of surviving banks.

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for the poor performance of the U.S. banking industry in the 1980s

Thus, it is not enough to understand how a subset of surviving banks behaves; one must look at the entire distribution to understand how the industry is evolving.

Reallocation effects have entered into discussions of the competitive process as successful firms grow and replace less successful competitors. In a highly regulated industry like banking, one might expect these reallocation effects to be less important than in more competitive manufacturing industries. While it is difficult to directly compare across industries, these results suggest that reallocation effects are also important in U.S. banks and are qualitatively similar to the manufacturing estimates, particularly in the less-regulated environment of the late 1980s and early 1990s.

An interesting area for future work is to systematically compare the magnitude and evolution of these reallocation effects over time and across states with different regulatory environments. Since states deregulated at different time and in different ways, this provides a mechanism to isolate the impact of competitive changes and quantify the direct impact on the reallocation effects.

Appendix

Data are from the Reports of Condition and Income, the "Call Reports," which include all banking institutions regulated by the Federal Reserve, the Federal Deposit Insurance Corporation, or the Office of the Comptroller of the Currency. Data contain balance sheet and income statement information on a quarterly and annual basis for each separately chartered banking institution. The sample was limited to the set of commercial banks defined by the Board of Governors' *Federal Reserve Board Bulletin* Table 1.26, "Assets and Liabilities of Commercial Banks." This sample includes only fully consolidated commercial banks in the 50 United State and the District of Columbia that are insured by the FDIC with a charter type that identifies them as a non-deposit trust company.

The sample was limited to "reasonable" observations. Criteria for exclusion were: assets or equity less than or equal to zero; assets, equity, loans, or net income missing; loans greater than assets; or ROE greater than 1000% or less than –1000%. Since data are reported with error, these bank observations were dropped from the sample. In addition, because the analysis is interested in differences between entering and exiting banks, a bank was dropped in every year if any of the following criteria were true even for a single year.

The breakdown of banks into tenure subsets employs very specific definitions. Surviving banks in Tables 2a and 2b and in the decomposition analysis are defined separately for each pair of years as the banks that operated in each of the two years. Surviving banks that acquire were identified using the National Information Center (NIC) Transformation Table, maintained by the Federal Reserve Board of Governors. To be identified as an acquirer, the bank was listed as the acquirer in any transaction in the NIC table in the second year. Non-acquirers are all other surviving banks. No adjustment is made for any changes in the structure of the bank, e.g., ownership change, or insurer change. The only requirement is that the same commercial bank entity number appears in consecutive years. The identifying variable is RSSD9001 in the Call Reports, which is a unique number assigned to each bank entity and doesn't changes throughout its lifetime.

Entering banks are defined as those that were observed in the second, but not the first, in a pair of years. Again, the bank identifier number in the Call Report is again used to determine a bank's existence. Exiting banks are defined as those that operated in the first, but not second, in a pair of years. The NIC data provided information about the disposition of the bank assets. A bank exit was identified as a failure based on the NIC definition of "entity fails and ceases to exist and disposition was arranged by the FDIC, RTC, NCUA, state, or other regulatory agency." All other bank exits were considered mergers, including mergers, splits, or exiting banks not separately identified in NIC. Note that these mergers do not indicate if failure was pending and thus could include very distressed banks.

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Table 1: Variation in Size, Profits, and Capital Adequacy in the U.S. Banking Industry, 1976-98

		Total Assets				Return on Equity (ROE)				Equity to Assets (E/A)			
Year	No. of Banks	75th Percentile	Mean	Median	25th Percentile	75th Percentile	Weighted Average	Median	25th Percentile	75th Percentile	Weighted Average	Median	25th Percentile
1998	8,740	150.5	525.2	71.8	35.8	14.58	13.20	10.99	7.56	11.95	9.75	9.47	8.01
1997	9,102	140.3	458.1	67.2	33.7	14.91	14.03	11.52	8.18	11.89	9.80	9.58	8.11
1996	9,458	134.7	401.5	64.9	32.8	14.93	14.04	11.75	8.54	11.53	9.51	9.43	8.00
1995	9,857	128.1	365.3	62.1	31.5	14.73	13.94	11.54	8.37	11.45	9.33	9.38	8.05
1994	10,353	119.6	327.1	57.6	29.7	15.36	14.28	11.94	8.65	10.81	8.86	8.90	7.62
1993	10,857	113.6	295.3	55.2	28.7	15.97	14.43	12.32	8.78	10.74	8.94	8.90	7.72
1992	11,311	109.3	270.5	52.4	27.1	15.76	12.10	12.11	8.26	10.31	8.29	8.52	7.35
1991	11,731	103.5	253.9	48.8	25.4	13.85	7.84	10.36	6.23	10.07	7.49	8.22	7.03
1990	12,103	99.0	240.8	46.6	23.6	13.63	7.78	10.11	5.66	10.01	7.25	8.11	6.88
1989	12,376	92.7	226.6	43.7	21.9	14.44	8.29	10.75	6.53	10.07	7.08	8.20	6.92
1988	12,688	85.7	207.9	41.1	21.0	13.93	13.89	10.32	5.84	9.98	7.22	8.11	6.86
1987	13,194	81.7	189.5	39.5	19.8	13.32	2.50	9.55	4.06	9.88	7.02	8.05	6.81
1986	13,621	79.6	181.9	38.4	19.3	13.89	10.35	9.72	3.20	9.69	7.11	7.92	6.64
1985	13,815	74.1	164.5	36.1	18.1	14.71	10.97	10.96	5.13	9.90	7.14	8.09	6.83
1984	13,917	69.8	148.9	34.1	17.2	14.56	10.16	11.22	6.39	9.92	7.26	8.09	6.87
1983	13,964	65.6	139.7	32.2	16.4	15.28	10.79	11.92	7.59	9.89	6.95	8.18	6.94
1982	13,994	59.4	128.7	29.8	15.1	15.97	11.58	12.50	8.43	9.86	6.91	8.26	7.12
1981	14,004	54.7	116.0	27.5	14.0	16.44	12.40	12.91	9.28	9.73	7.05	8.25	7.18
1980	14,039	50.3	105.7	24.9	12.6	16.49	12.96	13.42	10.38	9.68	7.03	8.24	7.19
1979	13,980	46.3	97.1	23.0	11.5	16.23	13.19	13.64	10.83	9.50	6.96	8.06	7.01
1978	14,008	42.2	87.9	21.1	10.6	15.03	12.32	12.64	9.88	9.24	6.91	7.86	6.83
1977	14,035	38.4	78.5	19.1	9.6	14.68	11.27	12.10	9.07	9.15	7.01	7.76	6.75
1976	14,047	34.2	69.7	16.9	8.5	14.74	10.93	11.99	8.69	9.26	7.20	7.83	6.81

Notes: Weighted averages use the denominator of each ratio as the weight. Assets are in millions. Return on equity and equity to assets are percentages.
Source: Call Reports.

Table 2a: Year-by-Year Comparison of Assets
for Surviving Banks, Entering Banks, and Exiting Banks, Selected Years

	1976-77		1985-86		1990-91		1997-98	
	1976	**1977**	**1985**	**1986**	**1990**	**1991**	**1997**	**1998**
				Surviving Banks - Acquirer				
Mean of Assets	414.7	503.7	942.0	1,224.7	1,600.4	1,835.5	5,091.8	6,849.0
SD of Assets	1,665.7	1,857.3	2,606.7	3,418.2	5,780.3	6,050.5	20,600.0	27,300.0
No. of Obs.	112	112	304	304	517	517	314	314
				Surviving Banks - Non-Acquirer				
Mean of Assets	67.3	75.8	146.8	160.5	179.0	181.6	267.9	295.3
SD of Assets	636.3	719.6	1,321.8	1,387.3	1,220.5	1,205.2	2,155.0	2,354.4
No. of Obs.	13,778	13,778	13,059	13,059	11,083	11,083	8,208	8,208
				Entering Banks				
Mean of Assets		5.1		37.9		133.6		75.1
SD of Assets		5.7		161.0		556.9		276.8
No. of Obs.		145		258		131		218
				Exiting Banks - Merged				
Mean of Assets	32.5		177.6		170.5		644.5	
SD of Assets	46.3		957.3		601.5		3,769.5	
No. of Obs.	152		358		443		577	
				Exiting Banks - Failed				
Mean of Assets	8.6		64.4		457.6		83.5	
SD of Assets	9.0		206.3		1,876.5		93.7	
No. of Obs.	5		94		60		3	

Notes: Surviving banks operated in both years of a particular comparison. Acquirers made an acquisition in that period; non-acquirers did not. Entering banks were observed in the second, but not the first, year of a particular pair of years. Exiting banks that failed were observed in the first, but not the second, year with the disposition arranged by a regulatory agency as identified in the NIC Transformation Table. Merged banks were all other banks that exited banks in a particular period. Mean of assets is in millions of dollars. SD of assets is standard deviation of assets, measured in millions of dollars.

Source: Call Reports and NIC Transformation Table.

Table 2b: Year-by-Year Comparison of Return on Equity (ROE) and Equity to Asset (E/A) for Surviving Banks, Entering Banks, and Exiting Banks, Selected Years

	1976-77		1985-86		1990-91		1997-98	
	1976	**1977**	**1985**	**1986**	**1990**	**1991**	**1997**	**1998**
				Surviving Banks - Acquirer				
Mean ROE	10.04	10.33	10.78	8.59	7.33	8.78	14.46	12.83
SD ROE	5.66	4.53	12.16	18.35	35.52	23.45	6.53	6.96
Mean E/A	8.22	7.12	8.86	8.41	8.32	7.76	9.29	9.17
SD E/A	3.76	1.58	8.90	10.04	7.19	5.63	4.33	2.37
				Surviving Banks - Non-Acquirer				
Mean ROE	10.65	11.06	5.93	1.38	6.66	6.82	11.11	11.03
SD ROE	10.51	11.33	28.64	46.55	24.87	28.06	9.39	14.60
Mean E/A	8.60	8.24	9.29	8.75	9.56	9.38	11.87	11.29
SD E/A	3.98	2.62	6.48	5.68	7.24	6.59	10.01	9.04
				Entering Banks				
Mean ROE		-6.35		-6.71		-0.79		-5.46
SD ROE		7.32		16.43		15.01		14.03
Mean E/A		30.67		25.01		24.11		38.07
SD E/A		18.26		258.00		23.63		25.64
				Exiting Banks - Merged				
Mean ROE	-7.84		-4.57		-4.30		11.30	
SD ROE	85.41		72.30		55.47		10.50	
Mean E/A	8.62		9.19		9.18		11.46	
SD E/A	4.45		9.75		10.34		12.08	
				Exiting Banks - Failed				
Mean ROE	-49.43		-104.05		-249.48		-166.52	
SD ROE	115.24		147.02		231.70		339.31	
Mean E/A	7.40		5.01		2.58		6.52	
SD E/A	1.48		2.22		1.81		4.76	

Notes: Surviving banks operated in both years of a particular comparison. Acquirers made an acquisition in that period; non-acquirers did not. Entering banks were observed in the second, but not the first, year of a particular pair of years. Exiting banks that failed were observed in the first, but not the second, year with the disposition arranged by a regulatory agency as identified in the NIC Transformation Table. Merged banks were all other banks that exited banks in a particular period. All numbers are percentages. SD is standard deviation.

Source: Call Reports and NIC Transformation Table.

Table 3: Evolution of the Sample of Commercial Banks, 1976-98
Number of Bank of Each Type

Year	Total	Exits	Survivors	Entrants
1998	8,740	580	8,522	218
1997	9,102	607	8,851	251
1996	9,458	564	9,293	165
1995	9,857	622	9,731	126
1994	10,353	567	10,290	63
1993	10,857	521	10,790	67
1992	11,311	489	11,242	69
1991	11,731	503	11,600	131
1990	12,103	464	11,912	191
1989	12,376	510	12,178	198
1988	12,688	730	12,464	224
1987	13,194	670	12,951	243
1986	13,621	452	13,363	258
1985	13,815	435	13,482	333
1984	13,917	415	13,549	368
1983	13,964	360	13,634	330
1982	13,994	282	13,722	272
1981	14,004	215	13,824	180
1980	14,039	134	13,846	193
1979	13,980	229	13,779	201
1978	14,008	172	13,863	145
1977	14,035	157	13,890	145
1976	14,047			

Notes: Total refers to the number of banks in the sample operating at the end of the current year. Exits operated at the end of the prior year, but left the industry before the end of the current year. Survivors operated at the end of both the prior year and the current year. Entrants operated at the end of the current year, but not the end of the prior year.
Source: Call Reports and NIC Table.

Table 4: Return on Equity (ROE) Decomposition, 1976-98

			Within Effect			Realloaction Effects					
Year	Industry	Change in Industry	Total	Acquirer	Non - Acquirer	Total	Share Consolidation	Share Non-Acquirer	Covariance Acquirer	Covariance Non-Acquirer	Entry
1998	13.203	-0.832	-0.481	-0.821	0.340	-0.351	0.039	0.197	-0.088	-0.430	-0.070
1997	14.035	-0.008	0.215	-0.061	0.276	-0.223	0.436	0.062	-0.337	-0.163	-0.222
1996	14.043	0.108	0.360	-0.135	0.495	-0.252	0.574	0.073	-0.708	-0.115	-0.076
1995	13.935	-0.342	0.370	-0.183	0.553	-0.712	0.059	0.128	-0.082	-0.671	-0.146
1994	14.277	-0.150	-0.437	-0.306	-0.131	0.288	0.086	0.108	0.015	0.110	-0.030
1993	14.427	2.325	2.084	0.788	1.296	0.240	0.060	0.025	0.131	0.083	-0.059
1992	12.102	4.261	3.373	0.278	3.095	0.888	0.714	-0.156	0.037	0.299	-0.007
1991	7.841	0.059	-1.169	-0.906	-0.262	1.228	0.162	-0.031	0.461	0.634	0.001
1990	7.782	-0.513	-2.728	-1.463	-1.264	2.215	0.408	-0.746	0.048	2.588	-0.083
1989	8.295	-5.598	-8.533	-0.433	-8.100	2.935	0.180	-0.051	0.041	2.848	-0.083
1988	13.893	11.390	9.634	0.951	8.683	1.756	0.614	-0.720	0.182	1.710	-0.030
1987	2.503	-7.846	-12.041	-1.378	-10.663	4.195	0.354	0.363	0.272	3.294	-0.088
1986	10.349	-0.618	-2.202	-0.079	-2.123	1.584	0.242	0.059	0.011	1.368	-0.096
1985	10.967	0.809	-0.071	0.055	-0.126	0.880	0.106	0.149	0.002	0.750	-0.127
1984	10.158	-0.636	-1.498	-0.040	-1.458	0.862	0.135	0.061	-0.028	0.786	-0.092
1983	10.794	-0.790	-1.806	0.028	-1.834	1.016	0.098	0.129	-0.018	0.908	-0.102
1982	11.585	-0.818	-1.320	-0.025	-1.295	0.502	0.043	0.093	-0.002	0.457	-0.089
1981	12.403	-0.558	-0.777	-0.011	-0.766	0.218	0.038	0.071	-0.032	0.230	-0.089
1980	12.961	-0.232	-0.506	-0.066	-0.440	0.274	0.016	0.060	0.001	0.242	-0.046
1979	13.192	0.871	0.770	0.065	0.705	0.101	0.005	0.039	0.025	0.078	-0.046
1978	12.322	1.048	0.935	0.063	0.871	0.113	0.016	0.049	0.005	0.072	-0.028
1977	11.273	0.341	0.216	0.002	0.215	0.124	0.035	0.052	-0.002	0.078	-0.037
1976	10.932										
Sum of All Years		2.271	-15.611	-3.679	-11.932	17.881	4.421	0.012	-0.064	15.157	-1.645
Positive Change Years		21.211	16.133	1.160	14.972	5.079	2.286	-0.521	0.133	3.589	-0.409
Negative Change Years		-18.941	-31.744	-4.839	-26.905	12.803	2.135	0.533	-0.197	11.567	-1.235

Note: Decomposition follows Equation (4) in text. The industry variable is a weighted average with equity as the weight. All values are percentages.

Table 5: Equity to Assets (E/A) Decomposition, 1976-98

			Within Effect			Realloaction Effects					
Year	Industry	Change in Industry	Total	Acquirer	Non - Acquirer	Total	Share Consolidation	Share Non-Acquirer	Covariance Acquirer	Covariance Non-Acquirer	Entry
1998	9.749	-0.053	0.024	0.040	-0.017	-0.077	0.028	-0.099	-0.002	-0.017	0.014
1997	9.802	0.290	0.220	0.144	0.076	0.070	-0.133	0.034	0.117	-0.092	0.144
1996	9.512	0.184	0.129	0.085	0.044	0.055	-0.004	0.022	0.059	-0.046	0.024
1995	9.328	0.466	0.508	0.112	0.396	-0.042	-0.010	-0.026	0.035	-0.063	0.023
1994	8.862	-0.078	-0.011	-0.013	0.002	-0.067	-0.028	0.034	0.006	-0.092	0.012
1993	8.940	0.649	0.646	0.135	0.511	0.003	0.008	0.003	0.021	-0.047	0.019
1992	8.291	0.805	0.765	0.258	0.507	0.040	0.010	0.026	0.099	-0.094	-0.001
1991	7.487	0.240	0.205	0.035	0.170	0.035	0.245	0.088	-0.220	-0.084	0.006
1990	7.247	0.163	0.130	-0.004	0.135	0.033	0.032	0.074	-0.018	-0.076	0.021
1989	7.084	-0.135	-0.143	-0.006	-0.137	0.009	0.011	0.049	-0.007	-0.064	0.019
1988	7.218	0.195	0.156	0.006	0.150	0.039	0.075	0.058	-0.012	-0.081	-0.001
1987	7.023	-0.084	-0.122	0.003	-0.125	0.038	0.054	0.025	-0.034	-0.030	0.022
1986	7.108	-0.028	-0.017	-0.030	0.013	-0.010	-0.003	0.064	0.000	-0.086	0.016
1985	7.135	-0.121	-0.163	-0.005	-0.158	0.042	-0.007	0.040	-0.001	-0.023	0.033
1984	7.256	0.301	0.276	-0.005	0.281	0.025	0.015	0.074	-0.001	-0.092	0.028
1983	6.955	0.049	0.030	-0.011	0.041	0.019	-0.009	0.064	-0.003	-0.063	0.028
1982	6.906	-0.143	-0.171	-0.073	-0.098	0.028	0.010	0.074	-0.014	-0.071	0.029
1981	7.048	0.015	0.042	-0.001	0.043	-0.027	-0.006	0.010	-0.002	-0.062	0.032
1980	7.034	0.072	0.047	-0.007	0.053	0.026	-0.003	0.067	-0.002	-0.053	0.016
1979	6.962	0.052	0.050	0.001	0.049	0.002	-0.008	0.025	0.000	-0.032	0.017
1978	6.909	-0.097	-0.084	-0.021	-0.063	-0.013	-0.004	0.022	-0.001	-0.039	0.010
1977	7.007	-0.189	-0.190	-0.008	-0.183	0.001	0.003	0.023	-0.007	-0.028	0.011
1976	7.196										
Sum of All Years		2.553	2.327	0.635	1.692	0.226	0.276	0.753	0.009	-1.332	0.520
Positive Change Years		3.481	3.205	0.748	2.457	0.276	0.214	0.521	0.070	-0.883	0.354
Negative Change Years		-0.928	-0.878	-0.113	-0.765	-0.050	0.062	0.232	-0.061	-0.449	0.166

Note: Decomposition follows Equation (4) in text. The industry variable is a weighted average with assets as the weight. All values are percentages.

Chart 1: Total Reallocation Effect from the ROE Decomposition